

Chapter C5: Non-Use Benefits

INTRODUCTION

Aquatic species without any direct uses account for the majority of losses due to impingement and entrainment (I&E) at cooling water intake structures (CWIS).

However, EPA's analysis of direct use benefits includes values only for organisms with direct uses, which comprise

a very small percentage of total losses (approximately two percent). Because the other 98 percent of losses, consisting of organisms without direct uses, are not without value, the potential exists for significant non-use values that have not been addressed under EPA's estimation of use benefits. For this reason it is important to consider non-use benefits to the human population, produced by the increased numbers of organisms without direct use values, under the final section 316(b) rule.

One way to consider the impact of the section 316(b) rule is to estimate the non-use value of baseline I&E losses and I&E reductions due to the final rule for each case study region using the non-use meta-analysis results. The non-use meta-analysis is presented in detail in Chapter A12, Non-Use Meta-Analysis Methodology, which includes discussions of the literature review process, the estimated regression models and results, and the general methodology used to estimate household and aggregate non-use benefits based on regression results. Total regional non-use benefits can be estimated using the following three steps:

1. Estimate annual changes in non-use value of the affected fishery resources per household due to the baseline impingement and entrainment (I&E) losses and the post-compliance reduction in impingement and entrainment;
2. Estimate the population of households in the North Atlantic region holding non-use value for the affected resources; and
3. Estimate the total non-use value to the affected North Atlantic populations for completely eliminating baseline I&E losses, and for reducing I&E losses from the baseline to post-compliance levels.

EPA explored this approach for the North Atlantic region. However, EPA did not include the results of this approach in the benefit analysis because of limitations and uncertainties associated with estimation of non-use benefits on a regional scale. For further discussion of the limitations and uncertainties of this method, refer to Chapter A12.

C5-1 QUALITATIVE ASSESSMENT OF ECOLOGICAL BENEFITS FOR THE NORTH ATLANTIC REGION

Changes in CWIS design or operations resulting from the section 316(b) regulations for existing facilities are expected to reduce I&E losses of fish, shellfish, and other aquatic organisms and, as a result, are expected to increase the numbers of individuals present, increase local and regional fishery populations, and ultimately contribute to the enhanced environmental functioning of affected waterbodies (rivers, lakes, estuaries, and oceans) and associated ecosystems. The economic welfare of human populations is expected to increase as a consequence of the improvements in fisheries and associated aquatic ecosystem functioning.

The aquatic resources affected by cooling water intake structures provide a wide range of services. Ecosystem services are the physical, chemical, and biological functions performed by natural resources and the human benefits derived from those functions, including both ecological and human use services (Daily, 1997; Daily et al., 1997). Scientific and public interest in protecting ecosystem services is increasing with the recognition that these services are vulnerable to a wide range of human activities and are difficult, if not impossible, to replace with human technologies (Meffe, 1992).

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In addition to their importance in providing food and other goods of direct use to humans, the organisms lost to I&E are critical to the continued functioning of the ecosystems of which they are a part. Fish are essential for energy transfer in aquatic food webs, regulation of food web structure, nutrient cycling, maintenance of sediment processes, redistribution of bottom substrates, the regulation of carbon fluxes from water to the atmosphere, and the maintenance of aquatic biodiversity (Peterson and Lubchenco, 1997; Postel and Carpenter, 1997; Holmund and Hammer, 1999; Wilson and Carpenter, 1999). Examples of ecological and public services disrupted by I&E include:

- ▶ decreased numbers of ecological keystone, rare, or sensitive species;
- ▶ decreased numbers of popular species that are not fished, perhaps because the fishery is closed;
- ▶ decreased numbers of special status (e.g., threatened or endangered) species;
- ▶ increased numbers of exotic or disruptive species that compete well in the absence of species lost to I&E;
- ▶ disruption of ecological niches and ecological strategies used by aquatic species;
- ▶ disruption of organic carbon and nutrient transfer through the food web;
- ▶ disruption of energy transfer through the food web;
- ▶ decreased local biodiversity;
- ▶ disruption of predator-prey relationships;
- ▶ disruption of age class structures of species;
- ▶ disruption of natural succession processes;
- ▶ disruption of public uses other than fishing, such as diving, boating, and nature viewing; and
- ▶ disruption of public satisfaction with a healthy ecosystem.

Many of these services can only be maintained by the continued presence of all life stages of fish and other aquatic species in their natural habitats.

The traditional approach of EPA and other natural resource agencies to quantifying the environmental benefits of proposed regulations has focused on active use values, particularly direct use values such as recreational or commercial fishing. Nonconsumptive uses (such as the importance of fish for aquatic food webs), and passive use or non-use values (including the value of protecting a resource for its own sake), are seldom considered because they are difficult to monetize with available economic methods. However, even though economists debate methods for indirect and non-use valuation, there is general agreement that these values exist and can be important. The potential magnitude of non-use values remains an empirical matter. EPA believes that non-use values are applicable for the section 316(b)-related I&E and that these values are likely to be appreciable for the North Atlantic region.